

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Unity Industrial (BD) Ltd
Address of the Factory	: Mir Mansion Rajakhali Road, Chaktai, Chittagong, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 20-May-2014
Fire & Electrical assessment conducted by:	Alliance
Date of Fire & Electrical Inspection	: 20 May 2014

BASIC INFORMATION:

The present garment factory is a six storied building with regular beam column frame structure. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: Column-beam RCC frame structure.
iii.	Floor System	: Beam supported slab
iv.	Floor Area	: 54,000 sft
v.	No. of Stories	: 6 storied building
vi.	Construction Year	: 2001
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Not available
ix.	Soil investigation Report	: Not available
x.	Construction Materials	: Reinforced Concrete (Brick aggregate with 40 grade rebar.)
xi.	Generator	: Ground Floor

RECOMMENDATIONS FOR CORRECTIVE ACTION:

The recommendations of corrective action for Structural, Fire and Electrical Safety comprises of Short Term, Mid Term and Long Term basis are as follows:

The recommendations for Structural Safety corrective actions are:

Immediate	: NA
Short Term: (3 Weeks)	:
	i. Develop a program to ensure that all live loads for which a floor or roof has been designed for will not be exceeded. The designated Load Manager shall oversee this program and ensure it is enforced.
	ii. Designate a representative as the Factory Load Manager. The Factory Owner shall ensure that at least one individual, the Factory Load Manager who is located onsite full time at the factory, is trained in calculating operational load characteristics of the specific factory.
Mid Term: (6 Weeks)	:
	i. Have a qualified structural engineer provide further analysis and investigation of the structural deficiencies. Structural engineer shall also provide remediation documents if required.

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- ii. Engage a qualified structural engineer to confirm structural performance of the structure. Each of the items listed in the description should be addressed separately.
- iii. Under guidance from a qualified structural engineer arrange Detail Engineering Assessment of the structure. This assessment should include destructive core testing to assess the in-situ concrete compressive strength as well as a confirmation of as-built reinforcing configuration via exploratory openings and/or additional ferro scanning.
- iv. Engage a qualified structural engineer to develop the required documents to confirm the structural integrity of the buildings. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- v. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition.
- vi. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- vii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- viii. Under guidance from a qualified structural engineer arrange Detail Engineering Assessment of the structure. This assessment should include a confirmation of as-built reinforcing configuration via exploratory openings and/or additional ferro scanning.
- ix. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- x. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- xi. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- xii. Have a qualified structural engineer assess the durability aspects as suggested in Alliance Standard Part 7 Section 7.2 and take appropriate remedial measures. Assessment should include core testing to confirm MCAC compressive strength as well as a confirmation of as-built reinforcing configuration via exploratory openings and/or additional ferro scanning.
- xiii. Under guidance from a qualified structural engineer arrange geotechnical investigation at close vicinity of the structure and make the report available for review.
- xiv. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3
- xv. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard. Floor load plans should be visibly posted on all levels of the building.

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- xvi. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xvii. Provide Certificates of Occupancy for review.

Long Term (6 Months) :

- i. The roof needs to be water sealed with a protective coating or needs to provide 2% slope to develop a proper drainage system.
- ii. Repair the exterior façade system to prevent water intrusion and dampness.
- iii. Necessary remediation after DEA.

The recommendations for Fire Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Remove all impediments, obstructions, and stored materials from the means of egress. Keep all elements of the means of egress (exit path, aisles, stairs, corridors, etc.) continuously free and clear of all obstructions in accordance with Alliance Standard Section 6.3.9.</p> <p>Remove all stored materials in the stairwells at the noted locations.</p>
<p>Short Term (3 Weeks)</p>	<p>Remove all locking devices from all egress doors and means of egress components in accordance with Alliance Standard Section 6.8. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.</p> <p>Remove the kitchen or provide an approved enclosure with finishing section in a safe manner as per Alliance Standard.</p>
<p>Mid Term (6 Weeks)</p>	<p>Post the occupant load for every assembly and production floor in the facility in a conspicuous space near the main exit or exit access doorway for the space.</p> <p>Develop a testing and maintenance program that ensures the operation of all egress lighting is verified at least once per year. If battery-operated lights are used, these lights shall be tested on a monthly basis. Functional testing of battery powered lights shall be provided for a minimum 90 min once per year.</p> <p>Conduct fire drills on a quarterly basis as outlined in BNBC Part 4 Appendix A for all garment facilities. Fire drills shall be conducted under the direction of a Fire Safety Director. All other requirements for fire drills shall be conducted in accordance with BNBC Part 4 Appendix A.</p> <p>Implement training in accordance with Alliance Safety Training Curriculum and keep record with proper documentation.</p> <p>Develop a testing and maintenance program that ensures the emergency power for exit signs is tested at least once per</p>

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	<p>year. If battery operated signs are used, these lights shall be tested on a monthly basis. Functional testing of battery powered signs shall be provided for a minimum 90 min once per year.</p> <p>Develop an emergency evacuation plan which includes duties and responsibilities of various people, interfacing between groups and fire brigade, headcount and identification of trapped victims, physically disabled people and their rescue, etc. and all components required by the Alliance Standards and communicate the plan to all employees. The evacuation plan shall include provisions to assist physically disabled persons. A list of all employees with physical disabilities shall be kept by the Fire Service Director.</p> <p>Post emergency egress maps or fire evacuation maps at the entrance to each exit stair or main point of egress.</p> <p>Install a new automatic fire alarm and detection system. Once installed, arrange for direct connection of the fire alarm and detection system to a central station monitoring service or the Fire Service and Civil Defense as per Alliance Standard Part 5 Section 5.7.5 Monitoring. Until that time that a central station monitoring service or direct connection to the Fire Service and Civil Defense can be set up, a person trained to contact the Fire Service and Civil Defense in the event of fire alarm activation shall be provided. An annunciator shall be located in a constantly attended location (such as a fire control room) to alert this person.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Obtain BERC License/weaver-certificate from Bangladesh Energy Regulatory Commission. Obtain boiler operator license from Bangladesh Boiler Inspection Department. Obtain electrician license from Bidyut License Pradan Board.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level in English and Bengali at the noted locations.</p> <p>Apply to Chittagong Development Authority (CDA) in an expeditious manner for issuance of the Certificates of Occupancy for main building according to building use.</p> <p>Establish an inspection, maintenance, and testing program for the standpipe and hose system as per NFPA 25 Chapter 6 Table 6.1.1.2.</p> <p>Establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</p> <p>Provide training and certification of at least 25 percent of workers in firefighting, first aid and rescue training by proper authority.</p>
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an alternative power source such as a generator. The generator is to be configured with an ATS (auto starter).

Install initiating devices and notification appliances as required by the Alliance Standard and NFPA 72. This includes electrical supervision of all valves controlling fire protection systems (sprinklers, fire pumps, water supplies, etc.). Connect devices to an automatic fire alarm and detection system for the facility. All fire alarm installations shall be submitted for review by the Alliance prior to commencement of installation.

Provide proper aisles marking (clear width minimum 36 in.) and keep aisles free of storage. The path of egress travel along a means of egress shall not be interrupted by any obstruction. The capacity of the means of egress shall not be reduced along the path of travel.

Consult a qualified structural engineer to assess the condition of the structure. Repair the crack and leakage of the slab and beam following instructions of the structural expert.

Place the extinguishers maintaining maximum spacing of 100 ft along path of travel. Fire extinguishers having a gross weight not exceeding 18.14 kg (40 lb) shall be installed so that the top of the fire extinguisher is not more than 1.53 m (5 ft) above the floor (NFPA 10 6.1.3.8) as mentioned in clause 5.6.2.1. Fire extinguishers having a gross weight greater than 18.14 kg (40 lb) (except wheeled types) shall be installed so that the top of the fire extinguisher is not more than 1.07 m (3½ ft) above the floor (NFPA 10.6.1.3.8) as mentioned in clause 5.6.2.2.

Select fire extinguishers based on potential fire class and hazards following NFPA 10 Chapter 5. Timber, Bamboo, coal, paints and similar combustible materials shall be kept separated from each other. A minimum of two dry chemical powder (DCP) type fire extinguishers shall be provided at both open and covered locations where combustible and flammable materials are stored as per clause 9.9. In a store of inflammable and/or fire-sensitive materials a 5 kg dry powder fire extinguisher conforming to accepted standards shall be kept at an easily accessible position. For electrical related fire (class C), CO₂ type and for liquid related fire (class B) foam type or powder type extinguisher are required.

Fire extinguishers are to be inspected, tested, and maintained in accordance with NFPA 10 Chapter 7 as demanded in Alliance Standard.

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	<p>Provide re-entry to floor levels from the stairwells in accordance with Alliance Standard Section 6.8.3.</p> <p>Provide handrails on both sides of each stairway. Intermediate handrails shall be provided when the stair width exceeds 2.2 m (87 in.). Mount new handrail at a height consistent with existing height (between 30 in. and 44 in).</p> <p>Install emergency lighting for all paths of egress in accordance with Alliance Standard Section 6.7. Illumination shall be a minimum of 10 lux for all corridors, exit doors, and stairways. Aisles shall be provided with a minimum 2.5 lux. Egress lighting shall be provided with emergency power or supplemented with battery powered lights that provide a minimum of 10 lux for not less than 30 mins in the event of failure of normal lighting.</p> <p>Provide fire-resistive rated construction barriers between hazard types in accordance with Alliance Standard Sections 3.4 and 4.5. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install illuminated exit signs at entrances to exits and along the path of egress anywhere the continuation of egress is not obvious or there is a change in the direction of the path of travel.</p> <p>Provide an emergency power source (battery back-up or connection to emergency power system) for illuminated exit signs.</p> <p>Provide Fire Department (Siamese) connections in accordance with Alliance Standard Section 5.5.4. Connections shall match the Fire Service and Civil Defense hose thread standard.</p> <p>Develop a hot-work permit program. The program must comply with the requirements of NFPA 51B.</p> <p>Make sure all required exit signs are illuminated continuously at all times. Exit signs may be illuminated either by lamps external to the sign or by lamps contained within the sign. The source of illumination shall provide not less than 50 lux at the illuminated surface with a contrast of not less than 0.5. Approved self-luminous signs which provide evenly illuminated letters having a minimum luminance of 0.2cd/m² may also be used.</p> <p>Create a Fire Safety Director position and fill the position with an individual that has had sufficient training to be able to carry the required duties.</p>
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	Establish written corporate and plant policies on housekeeping to ensure scheduled cleaning for floor, wall, ceiling, supply and return air ventilation systems. Promptly reschedule skipped cleanings. Provide a documented line of authority for authorizing a cleaning delay and rescheduling.
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The recommendations for Electrical Safety corrective actions are:

Immediate	NA
Short Term (3 Weeks)	<p>Install two distinct earth connections of minimum 35 sqmm for the generator frame earthing.</p> <p>Light fixtures without protective covers (otherwise known as naked lights) shall not be allowed in storage areas or in any area where the Inspector of the Factories Rules (1.6.3.7) Part 53 disallows these fixtures. Install signs posted in Bengali and English, indicating this prohibition at all entrances to these areas.</p> <p>Use PVC connector with PIB tape wound around with a junction box with every cable joints.</p> <p>Ensure inspection, maintenance, and testing procedures of the emergency generator being completed and documented.</p> <p>Develop and implement an electrical safety program. Include key topics such as lock out tag out procedures, personal protective equipment requirements, etc. Reference NFPA 70e for example program requirements.</p>
Mid Term (6 Weeks)	<p>All metal casings or metallic coverings containing or protecting any electrical supply-line or apparatus shall be connected with earth.</p> <p>Install meters and other electrical devices (Ammeter, Voltmeter etc) on panels.</p> <p>Install phase separators between terminal connections. Verify phase separators are installed at all locations (MCCB).</p> <p>Provide a capacity information label which contains the current carrying capacity and size of main cable, rated capacity of circuit breaker and the busbar (with dimension). Display panel schedules posted on panels' door (inner side).</p> <p>Provide electrical graded rubber mats with the specifications of 650 V-protection and required area (accommodating at least two person or depending on the panels' length).</p> <p>Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system.</p> <p>Provide covers to conceal all live internal components of switchboards and distribution boards.</p>

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Long Term (6 Months)	<p>Complete Thermographic scans at least on a three year cycle. Thermographic scans should be completed in accordance with the Standard for Infrared Inspection of Electrical Systems & Rotating Equipment and NFPA70B or a comparable standard.</p> <p>Develop an Insulation Resistance Measurement Program that ensures deterioration of insulation resistance will be identified quickly. Testing should be in compliance with International Electrical Testing Association (NETA). All transformers, switchgears etc. shall be subject to an insulation resistance measurement test to ground after installation but before any wiring is connected. Insulation tests shall be made between open contacts of circuit breakers, switches etc. and between each phase and earth.</p> <p>Consult with an expert electrical engineer and make sure your system is secured against lightning.</p>
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